

RECEIVED
CENTRAL FAX CENTER

Appl. No.: 10/731,745
Amdt. Dated: 07/03/06
Off. Act. Dated: 03/03/06

JUL 03 2006

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested in view of the foregoing amendments and discussion presented herein.

1. Rejection of Claims 2-23, and 25-35 under 35 U.S.C. §103(a).

Claims 2-23 and 25-35 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hoffman (U.S. No. 5,352,512) in view of Empedocles et al. (U. S. No. 6,962,823). These rejections have been overcome in part and traversed in part as follows.

a. Claims 2-23 and 25-29

Claims 4, 5, 8, 13, 23 all recite, among other elements, a method of fabricating a nanotube comprising the steps of forming a nanowire, and a sheath of material over the nanowire, wherein the sheath comprises the nanotube upon removal of the sheath. In particular, Claims 5, 8, 13, and 23 all recite a single-crystalline sheath material.

Furthermore, Claim 4 recites a sheath formed from an epitaxial casting. The abovementioned elements have not been shown nor suggested by any reasonable combination of the cited art.

Generally, Applicants note that the present rejection does not establish *prima facie* obviousness under 35 U.S.C. §103(a) and M.P.E.P. §§2142-2143. Firstly, the present Office Action has not established that the prior art references, alone or in combination, teach or suggest all of the claim limitations. M.P.E.P. §§2143.02; *In re Royka*, 180 U.S.P.Q 580 (CCPA 1974).

Applicant's fail to identify any teaching or suggestion in either of the Hoffman or Empedocles et al. references for forming a nanotube from a single-crystalline material or an epitaxial casting. As conceded in Page 3 of the present Office Action, Hoffman clearly only discloses fabrication of nanotubes having a polycrystalline or amorphous materials such as carbon or quartz. To cure this deficiency, the Examiner cites Empedocles et al. for allegedly teaching "single crystalline nano-structured nano-wires." Empedocles et al. is directed to a method of making nanowires, and is void any

Appl. No.: 10/731,745
Amdt. Dated: 07/03/06
Off. Act. Dated: 03/03/06

discussion of formation of nanotubes, and in particular forming nanotubes from an epitaxial casting. Thus, the combination of Empedocles et al. with Hoffman merely yields a teaching of single crystalline nanowires, and does not teach or suggest the formation of single crystalline nanotubes formed around the nanowires. The fabrication of nanotubes is vastly different than the formation of a nanowire, because processes, such as substrate removal, will vary based on the nanowire substrate material. For example, removal of a graphite or carbon substrate will require different processes than removal of an epitaxial layer. (see Hoffman, col. 3, lines 12-14).

Secondly, no suggestion or motivation, either in the cited references or in the knowledge generally available to one of ordinary skill in the art, has been cited in the Office Action for the proposed combination of the reference teachings so as to produce the claimed invention. M.P.E.P. §§2143.01; *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

Applicants were unable to find any suggestion or motivation in the Empedocles et al. for forming single-crystalline nanotubes, nor is there any discussion in Hoffman for providing suggestion or motivation to modify the disclosed carbon-based nanotubes to have a single-crystalline structure. As explained above, the fabrication of nanotubes is considerably different than formation of the nanowires described in Empedocles et al. The present invention involves casting a nanotube around a nanowire. Empedocles et al. is absent any discussion or suggestion of forming a single crystalline nanotube, or that such a process is even possible based on the methods it teaches. Therefore, one skilled in the art would have no motivation to modify the processes disclosed in Hoffman with those of Empedocles et al.

In addition to being allowable being dependent on an allowable base claim, dependent Claims 2-3, 6-7, 9-12, 14-22 and 25-29 recite additional elements not found in the cited references. For example, Claims 10 and 11 recite a sheath comprising multiple longitudinal segments. Neither reference teaches or suggests formation of segmented nanotubes as disclosed in the present invention.

Appl. No.: 10/731,745
Amdt. Dated: 07/03/06
Off. Act. Dated: 03/03/06

Therefore the rejection of claims 2-23 and 25-29 under §103(a) is improper and should be removed.

b. Claims 30-35

Claim 30 recites, among other elements, forming a sheath of a modified first material over a nanowire, the sheath formed on the nanowire by a thermal oxidation process in which temperature determines the thickness of the sheath, wherein the temperature of said thermal oxidation is in the range of from approximately eight hundred degrees Celsius (800 °C) to approximately one thousand degrees Celsius (1000 °C). These elements are not shown in the cited art.

As explained above, Empedocles et al. only discusses nanowire fabrication, and thus its combination with Hoffman fails to teach fabrication of a nanotube sheath by the thermal oxidation process as recited in Claim 30. Furthermore, Empedocles et al. does not teach a thermal oxidation temperature range from approximately 800°C to 1000°C as recited in Claim 30. Page 5 of the present Office Action states that Empedocles allegedly teaches of "specified temperature reactions range around 400°-500°." However, Applicants were unable to find such a range described in the Empedocles et al. (the only temperature reference found was with regard to a reactor 630 temperature of "about 400°", col. 40, line 46, and col. 41, line 43). Even if such a range were established, it certainly is not at or near the 800°C to 1000°C range specified in Claim 30. Finally, both Empedocles et al. and Hoffman are void any discussion of determining the thickness of the sheath via the temperature of the thermal oxidation process.

Therefore, Claim 30, and Claims 31-35 dependent therefrom, are patentably distinct from the cited art, and their rejection under §103(a) is improper.

Claims 31-35, in addition to being allowable for being based on an allowable base Claim, also recite additional elements not found in the cited art. For example, Claim 31 recites use of an etch-resistant material that comprises a dimer or polymer, such as perylene(Claim 32). Claim 33 recites removing the top end of the sheathed

Appl. No.: 10/731,745
Amdt. Dated: 07/03/06
Off. Act. Dated: 03/03/06

nanowire by etching in oxygen plasma to remove sufficient depth of said etch-resistant material to expose said sheathed nanowires. Claim 34 recites removal of the silicon nanowire via etching in xenon fluorine (XeF2). None of the above described elements are shown or suggested in the cited references, and thus are individually allowable for the limitations that they recite.

c. New Claims 36, 37

New independent claim 36 recites a forming a sheath having a plurality of layers. Claim 37 further recites that each of the plurality of sheath layers comprises one or more of: different materials, different doping constituents, or different doping layers. Support for these new claims can be found in the present application with reference to FIGS. 17-22 and corresponding text in paragraphs [00117] to [00123]. Applicants were unable to find any mention of nanotube layering as described in Claims 36 and 37. Therefore, new claims 36 and 37 are in condition for allowance.

2. Amendments Made Without Prejudice or Estoppel.

Notwithstanding the amendments made and accompanying traversing remarks provided above, Applicants have made these amendments in order to expedite allowance of the currently pending subject matter. However, Applicants do not acquiesce in the original ground for rejection with respect to the original form of these claims. These amendments have been made without any prejudice, waiver, or estoppel, and without forfeiture or dedication to the public, with respect to the original subject matter of the claims as originally filed or in their form immediately preceding these amendments. Applicants reserve the right to pursue the original scope of these claims in the future, such as through continuation practice, for example.

3. Conclusion.

Based on the foregoing, Applicants respectfully request that the various grounds for rejection in the Office Action be reconsidered and withdrawn with respect to the presently amended form of the claims, and that a Notice of Allowance be issued for the present application to pass to issuance.

Appl. No.: 10/731,745
Amdt. Dated: 07/03/06
Off. Act. Dated: 03/03/06

In the event any further matters remain at issue with respect to the present application, Applicants respectfully request that the Examiner please contact the undersigned below at the telephone number indicated in order to discuss such matter prior to the next action on the merits of this application.

Date: 7/3/06

Respectfully submitted,



John P. O'Banion, Reg. No. 33,201
Robert F. Kramer, Reg. No. 51,242
O'BANION & RITCHIEY LLP
400 Capitol Mall, Suite 1550
Sacramento, CA 95814
(916) 498-1010